

Year 2 Report for the grant

**“The Analysis and Archival of High Resolution
Doppler Imager (HRDI) Data in the Mesosphere,
Lower Thermosphere, and Ionosphere Region”**

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1. Introduction

This report covers the activities for the second year of the grant, “The Analysis and Archival of High Resolution Doppler Imager (HRDI) data in the Mesosphere, Lower Thermosphere and Ionosphere Region.” The second year funding covered the period April 2003 until April 2004.

2. Data conversion

The process to convert the HRDI data from VMS native files to netCDF format is nearly complete with the progress summarized in Table 1.

Table 1. Data Conversion Status

Data level	Description	Status
Level 1	Raw spectra and engineering data	Program to convert data to netCDF written and tested. File format documentation complete
Level 2a	Spectra converted to geophysical units; un-inverted line of sight quantities	Program to convert data to netCDF written and tested. File format documentation complete
Level 2b	Vector profiles winds, profiles of other products	Program to convert data to netCDF written and tested. File format documentation complete
Level 3	Level 2b output gridded onto standard format	Program to convert to netCDF written and tested. File format documentation complete.
Orbit data	Daily description of UARS orbit	Program to convert to netCDF written and tested. File format documentation complete
Attitude data	Daily description of the UARS attitude	Program to convert to netCDF written and tested. File format documentation complete
SUSIM level 3b ¹	SUSIM solar flux data; used in the processing of HRDI ozone data	Program to convert to netCDF written and tested. File format documentation complete.
SOLSTICE level 3b ¹	SOLSTICE solar flux data; used in the processing of HRDI ozone data	Program to convert to netCDF written and tested. File format documentation complete.
UKMO assimilation model results ²	Daily state of the lower atmosphere	Program to convert to netCDF written and tested. File format documentation complete.
Star Catalog	Catalog of star positions. Used in analysis of telescope	Program to convert to netCDF written and tested. File format documentation complete.

Data level	Description	Status
	alignment	
Orbit/Time	Time orbit commences	Program to convert to netCDF written and tested. File format documentation complete.
Solar, Lunar, and Planetary Ephemeris	Position of sun, moon, and planets	Program to convert to netCDF written and tested. File format documentation complete.
TMAT coefficients	Daily coefficients derived from the fitting of the TMAT model	To be completed

Note 1: SUSUM or SOLSTICE can be used interchangeable in the data processing. Both will be converted to insure complete overlap with the HRDI data. Note 2: The UKMO results are used in the processing of HRDI stratospheric measurements and in data analysis. However, because of the data restrictions, these data will not be made available to the general community.

3. Metadata Conversion

Several thousand pages of documentation have been scanned, converted to PDF documents, organized and placed on the HRDI web site where they can be viewed. (<http://hrdi.engin.umich.edu/>).

4. Tide-Mean Assimilation Technique (TMAT) Development

The refinement of the TMAT model continues under the direction of Dr. Ortland. Version 1, which analyzes monthly binned data has been implemented on the HRDI system at UM and comparisons with the HRDI data are underway. Figures 1 and 2 show sample comparisons. The most striking feature to be noticed is that the diurnal tidal features that so dominate the wind field, expand closer to the poles than predicted by the model. The model is currently being refined to better represent the latitudinal characteristics. In addition a version of the model that can fit data on a daily basis is being tested and will soon be implemented.

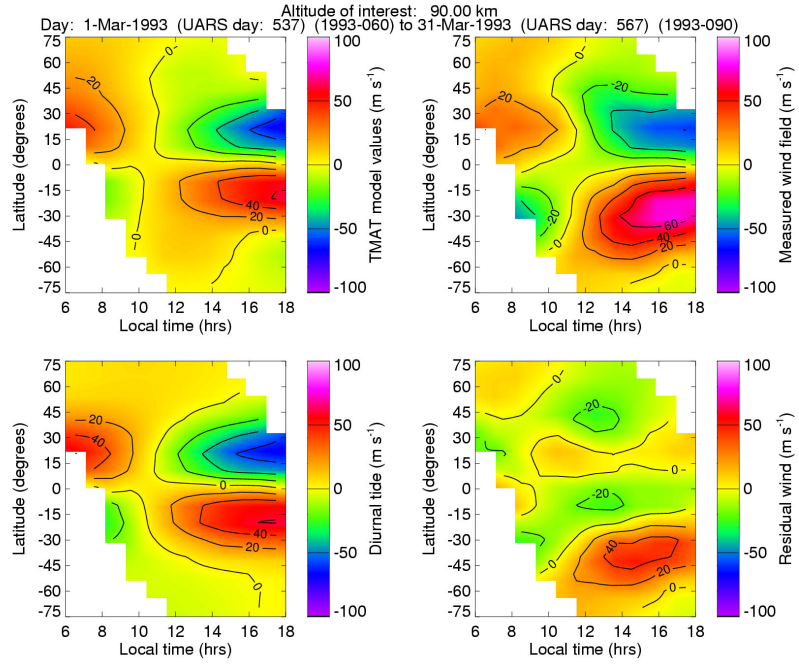


Figure 1. Comparison of monthly averaged TMAT and HRDI data. This figure shows a local time-latitude plot for 90 km altitude. The panel in the lower left shows the TMAT fit diurnal tide; the upper left shows the TMAT fit to the diurnal and semi-diurnal tide; the upper right presents the corresponding HRDI data; and the lower right is the difference between the model and data.

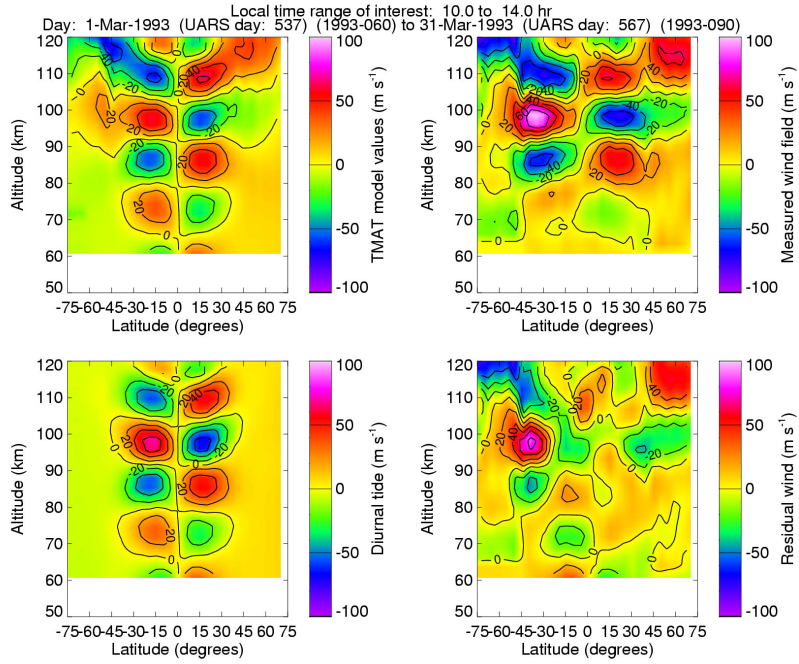


Figure 2. Comparison of monthly average of the TMAT model and HRDI data. The panel descriptions are the same as figure 1.

5. Database development

The daily operational history of HRDI has been incorporated into a database and linked to the HRDI web site. This allows a user to examine HRDI activities on any day during the UARS mission. A more robust and flexible database program is being incorporated during the summer of 2004.

6. Summary

Year 2 activities have proceeded as hoped, with no serious problems encountered. Much of the work has been performed using undergraduate students (up to 6 part-time students at any one time). This has given this project an opportunity to provide a meaningful educational and work experience to a number of students. In the third year the HRDI data will be converted and made available to the community on the web. The TMAT model will be refined and a version that allows calculation of the tidal amplitudes on a daily basis will be incorporated.